

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.

REMARKS

Claims 16, 26, 28, 31, 35, 38, 51 and 53-54 are amended, claims 58-63 are added, and claim 52 is cancelled by this amendment. Upon entry of this amendment, claims 12, 14-17, 24-29, 31-36, 38-41, 50, 51 and 53-63 will be pending. Applicants acknowledge that claims 18, 30, 37 and 42-49 are withdrawn from consideration.

* A Supplemental Information Disclosure Statement and the required fee is enclosed.

Regarding added claims 58-63, antecedent basis for the subject matter recited in the claims is provided at page 10, lines 7-10 of the substitute specification. Applicants submit the claims as patentable.

Acknowledgment of Allowed/Allowable Claims

Applicants acknowledge that claims 12, 14-17, 24, 25 and 29 are allowed. Further, claims 26-28, 32, 33 and 39-40 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112 set forth in the action and to include all of the limitations of the base claim and any intervening claims.

Drawings

Applicants respectfully request acceptance of the formal drawings filed on December 9, 2002.

Objection to the Specification

The specification is objected to as failing to provide proper antecedent basis for the subject matter of claim 16. While claim 16 is not limited to the described embodiments, claim 16 and the specification are amended to recite a vent passage inlet and to thereby overcome the objection.

Rejection of Claims 26-28, 34, 35, 52-57 under 35 U.S.C. § 112

Claims 26-28, 34, 35 and 57 are rejected under § 112, second paragraph for failing to particularly point out and distinctly claim the subject matter which applicant regards as the

invention. The Examiner asserts that the overflow vent passage and vent passage are the same elements but characterized as different elements in different embodiments.

The specification refers to a vent passage 148 with respect to Figure 4 and a vent passage 200 with respect to Figure 5. As seen in Figure 4, the vent passage 148 extends from an annular cavity 150 surrounding the cavity 106 of the outer body 104 to remove reactant collecting therein. As set forth at page 9, lines 31-33, of the substitute specification, the vent passage 148 prevents reactant from contaminating adjacent substances M deposited on the substrate S. The specification also refers to an overflow vent passage 254 at page 13, line 1, and shown in Figure 6. As set forth at page 13, lines 23-25, the overflow vent passage allows for higher reactant flow rates while enabling control of contact time because excess reactant entering from the reactant source passage 242 can be vented through the overflow vent passage. Thus, it is clear that applicants' probe can have multiple vent passages for venting reactant from different locations and for different purposes. In some claims, applicants have identified the vent passage and overflow vent passage as separate elements in order to claim different features of the probe. Although applicants disagree with the rejection, in order to expedite allowance of claims 26-28, 34, 35 and 57, claims 28, 35 and 57 have been amended to recite that the overflow vent passage is positioned in the body to remove excess reactant before said excess reactant reaches the outlet. Claims 26 and 34 are also amended to expedite allowance. Accordingly, the rejection of claims 26-28, 34, 35 and 57 should be withdrawn.

Claims 52-56 are rejected under § 112 second paragraph for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. As best understood, the Examiner asserts that the use of the term plug is confusing. As recognized by the Examiner, the specification refers to the "inner body" and "plug" as interchangeable terms for a single element. Claim 51 has been amended to include the limitations previously found in claim 52. Although applicants

disagree with the rejection, in order to expedite allowance claims 51 and 53-56 are amended to replace the term "plug" with the interchangeable term "inner body". Accordingly, the rejection of these claims should be withdrawn.

General Considerations

The present invention relates generally to probes for reaction product analyzers such as scanning mass spectrometers and photothermal deflection spectrometers, and more particularly to a sampling probe for delivering reactants to substances such as catalysts and for sampling resulting reaction products.

Due to the inherent limitations of conventional sampling probes, reaction products from low activity reactants are difficult to detect, particularly where relatively long reaction times are required. Further, such conventional sampling probes do not entirely eliminate the potential for contamination of adjacent substances on the substrate. Applicants' invention is directed to a sampling probe capable of significantly increasing the contact time or residence time between the reactants and the substances so that reaction products from low activity reactants can be detected. Further, the probe significantly reduces the potential for contaminating adjacent substances on a substrate. In some embodiments of the invention (e.g., those shown in Figs. 4 and 6), the probe includes a resiliently compliant element which enables the probe to make better contact with the substrate and thereby detect reaction products from low activity reactants. The probe may also include a vent passage to prevent reactant from contaminating adjacent substances deposited on the substrate, and/or an overflow vent passage which facilitates better control of the contact time. Additionally, in another embodiment, the probe includes a plurality of reactant source passages extending through the probe from a plurality of reactant sources.

Rejections Under 35 U.S.C. § 102

Claim 31

Claim 31 is directed to a sampling probe comprising among other things:

- a) **a recess in the tip** sized and shaped for receiving at least a portion of the reaction product,
- b) a reaction product sampling passage extending from the recess,
- c) a reactant delivery passage extending to **an outlet positioned at an exterior of the tip** for delivering reactant to the substance on the substrate to form the reaction product, and
- d) **wherein the tip includes at least one opening separate from the sampling passage permitting reactants to flow from the exterior of the tip into the recess when the tip contacts the substrate.**

Claim 31 is rejected as anticipated by U.S. Pat. No. 3,607,094 (Beer) and by 5,959,297 (Weinberg). Beer generally shows an apparatus for transferring (or "pipetting") a liquid sample from a test tube of a first series 1 of test tubes to another test tube of a second series 2 of test tubes and for supplying liquid reagent to the quantity of liquid sample thus transferred. (Col. 1, lines 55-60.) Beer shows a cannula 6 connected to a pump that is operable to draw a liquid sample into the cannula when the cannula is lowered into the test tube of the first series. (Col. 1, lines 63-69 and col. 2, lines 33-38.) The cannula is thereafter moved along a path (shown as dotted line 7 in the Figure) to a position **above** the test tube of the second series 2, and the sample is released from the cannula into the test tube. (Col. 2, lines 36-51.) Simultaneously with the release of the sample into the test tube, or thereafter, liquid reagent from container 5 is transferred by a pump 21 through conduit 20, valve 19, cylinder 8 and cannula 6. (Col. 2, lines 11-17 and 55-65.) Liquid reagent may also be supplied through branch conduit 26 to rinse the exterior of the cannula 6. (Col. 2, lines 66-75.)

Beer does not anticipate claim 31 because the reference does not show a tip including at least one opening separate from the sampling passage permitting reactants to flow from an outlet at an exterior of the tip into the recess when the tip contacts the substrate. The Examiner asserts that both passages of Beer have tips with outlets having openings in order for fluids to be drawn in or withdrawn into the passages. (Page 6 of the Office action.) However, Beer does not shows an outlet at an exterior of the tip, nor an opening separate from the sampling passage permitting reactants to **flow from the exterior of the tip into the recess when the tip contacts the substrate** as recited in claim 31. It is clear from claim 31, as amended, that applicants' reactant delivery passage outlet, the opening(s) in the tip, and the product sampling passage are separate elements. An exemplary opening in the tip permitting reactants to flow into the recess is shown in Fig. 4 and is described as "groove 262" at page 15, lines 4-7 of the substitute specification. The groove or opening increases flow under and through the tip when the tip contacts the substrate. In contrast, **Beer's tip is positioned above the tube, not in contact therewith, and Beer's tip does not have an opening separate from the sampling passage permitting reactants to flow into the recess when the tip contacts the substrate.** Accordingly, claim 31 is patentable over Beer for at least these reasons.

Weinberg generally shows a conduit system 800 including a sampling probe 802, a gas inlet conduit 804 and a gas outlet conduit 806. (Col. 15, lines 30-37; Figs. 8-10.) The gas inlet conduit 804 includes an inner passage 904 coupled to an inner passage 906 of the probe. Reactant gas is delivered through the inlet conduit, the inner passage and through a conduit 1000 to a library element or predefined location on a substrate located at the distal end of probe 802. A capillary may also be included through the conduit. (Col. 17, line 57 to col. 18, line 32.) The gas outlet conduit 806 is coupled to the sampling probe 802 with an outer passage 908. (Col. 15, lines 39-47.)

In use, reactant gases are delivered from a source chamber through passages 904, 906 of inlet conduit 804 and the sampling probe 802, respectively, and through conduit 1000 and to the substrate. (Col. 15, lines 56-67 and col. 17, line 57 to col. 18, line 32.) The reactant gases react with the material(s) on the substrate to form one or more gas products. The gas products are then drawn back through the conduit or the capillary therein and through passage 906 of the sample probe to a reaction chamber. Note that Weinberg also shows an embodiment in Fig. 24 in which reactant gas is delivered through inner tube 2407 to outlet or reaction area 2411 and the products are exhausted through outer tube 2409 and lines 2417. As shown, the distal end of the outer tube 2409 appears to contact the substrate 2405.

Weinberg does not show the claimed outlet positioned at an exterior of the tip and does not show the at least one opening separate from the sampling passage permitting reactants to flow from the exterior of the tip into the recess when the tip contacts the substrate. Accordingly, claim 31, as amended, is patentable over Weinberg.

Claims 36 and 50 depend from claim 31 and are patentable over the cited references for the same reasons as claim 31.

Claim 38

Independent claim 38 is directed to a sampling probe comprising, among other things:

- a) a reactant delivery passage extending to an outlet positioned at the tip for delivering reactant to the substance on the substrate; and
- b) an overflow vent passage positioned in the body to remove excess reactant **before said excess reactant reaches the outlet for optimizing contact time between the reactant and the substance.**

Claim 38 is rejected as anticipated by Weinberg. Claim 38 is patentable over Weinberg because the reference fails to show an overflow vent passage positioned in the body to remove excess

reactant before said excess reactant reaches the outlet for optimizing contact time between the reactant and the substance.

Weinberg shows an outer passage 908 extending from an annular opening 1004 at the tip of the probe for removing excess reactant. (See Fig. 10.) Weinberg fails to show an overflow vent passage **positioned in the body to remove excess reactant before said excess reactant reaches the outlet**. In Weinberg, any excess reactant would have to flow out through the outlet opening at the tip before it could reach the annular opening 1004. In contrast, applicants' claim is directed to an overflow vent passage in the body which allows for higher reactant flow rates and which removes excess reactant before the excess reactant reaches the outlet. As described at page 13, lines 1-10 and 23-30 of the substitute specification, the overflow vent passage allows the contact time to be controlled substantially by the flow rate through the product sampling passage 240 and the recess volume, thereby enabling optimization of the contact time. Weinberg fails to show the claimed construction and claim 38 is, therefore, submitted as patentable over Weinberg.

Claim 41 depends from claim 38 and is submitted as patentable for the same reasons as claim 38.

Claim 51

Claim 51 is directed to a sampling probe and comprises among other things:

- a) an outer body having an inner cavity, an inner body positioned in the inner cavity,
- b) **a mixing chamber inside the probe** above an upper end face of the inner body for mixing reactants therein, and
- c) **a plurality of reactant source passages extending through the probe from a plurality of reactant sources to the mixing chamber** for delivering reactants to the mixing chamber.

Claim 51 is rejected as anticipated by Weinberg. The Examiner states that "[s]ince reactants are delivered through two passages (904, 902), the junction of the two passages (904, 902) is the mixing chamber in which the reactants mingle." The

Examiner has misinterpreted Weinberg in this regard. Weinberg discloses that reactant gases are delivered from a single source (inlet conduit 804, see Figs 8-9 and col. 15, lines 56-67) and flow through the passages 904 and 906. Weinberg does not disclose a mixing chamber inside the probe, nor a plurality of reactant source passages extending through the probe to the mixing chamber. In contrast, applicants' construction includes a plurality of reactant source passages (e.g., tubes 138 of Fig. 3) extending to a mixing chamber (e.g., chamber 244 in Fig. 6). Among other advantages, the mixing chamber enables more precise liquid flow rate control, especially at very low flow rates. Accordingly, claim 51 is patentable over Weinberg.

Claims 53-56 depend from claim 51 and are patentable over Weinberg for the same reasons as claim 51.

Claim 54 states that the probe further comprises a cover mounted on the body covering the inner body and forming **an upper recess** between the cover and a lower end face of the inner body, and an aperture extending through the cover to permit reactants to pass through the cover to the substance, **wherein the aperture is offset from the reactant delivery passage in the inner body to promote mixing of the reactants in the upper recess**. Weinberg does not teach or suggest an upper recess or an offset aperture as recited in claim 54. Indeed, the Examiner does not assert that Weinberg shows an offset aperture to promote mixing in an upper recess. Accordingly, claim 54 is patentable for these additional reasons.

Claim 57

Independent claim 57 is directed to a sampling probe comprising, among other things, an **overflow vent passage in fluid communication with a mixing chamber and positioned in the body for removing excess reactant from the mixing chamber before said excess reactant reaches said outlet**. To the extent that claim 57 corresponds to claim 38, it is submitted as patentable for the same reasons as claim 38. Also, claim 57 recites a mixing chamber positioned inside the probe. To the extent claim 57

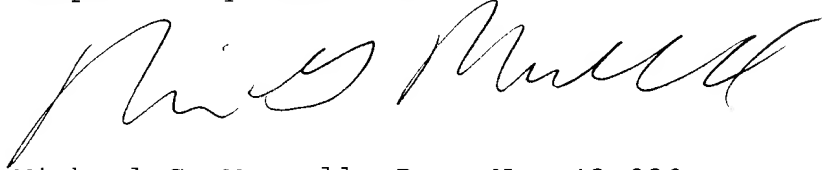
corresponds to claim 51, it is submitted as patentable for the same reasons as claim 51.

CONCLUSION

In view of the foregoing, allowance of the application is respectfully requested. The undersigned requests a telephone call from the Examiner if this would expedite allowance of the application.

* Enclosed is a check and fee transmittal for a one-month extension of time. The Commissioner is hereby authorized to charge any fee deficiency or credit any overpayment to Deposit Account No. 19-1345 in the name of Senniger, Powers, Leavitt & Roedel.

Respectfully submitted,



Michael G. Munsell, Reg. No. 43,820
SENNIGER, POWERS, LEAVITT & ROEDEL
One Metropolitan Square, 16th Floor
St. Louis, Missouri 63102
(314) 231-5400

MGM/clh

Express Mail Label No. EV 327056125 US